

more carbon must be brought into the bath than is necessary with the pig and scrap process, the after-removal of which prolongs the process, and thus working without pig involves still further expenditure of fuel.

Further, there is a deficit of silicon from pig iron, on which ground care should be taken that the necessary amount of SiO₂ for slag formation is at the disposal of the bath. A deficiency is not to be feared with bad scrap, but with good scrap it may well take place, and then an addition of good final slag from a previous charge is to be recommended. In charges consisting solely of scrap the manganese is low under all circumstances, which must have, as a consequence, metal containing oxygen, which again requires increased additions of ferro-manganese for deoxidation. This defect can sometimes be redressed by means of additions of manganese ores.

The remainder of the course of the scrap-carbon process, which is seldom carried out, is the same as the pig-iron-scrap process. Dr. Ing. Th. Naske gives in "Stahl und Eisen," 1907, p. 191, an example of a charge of the sort. Sixteen thousand kilogrammes soft steel-scrap were charged together with briquettes which consisted of 320 kilogrammes small coke, 160 kilogrammes tar, and 420 kilogrammes Caucasian manganese ore containing 50 per cent. Mn, and 320 kilogrammes limestone and 10 kilogrammes river sand served as further additions. After melting down, the metal was soft, contained 0.66 per cent. Mn, and was free from red shortness. The "finished" test showed 0.45 per cent. Mn and 0.07 per cent. C, and the "heat" took 315 minutes, reckoned from the beginning of charging to tapping. The same furnace produces 20,000 kilogrammes steel in 280 minutes by the pig and scrap process.

(c) The Pig and Ore Process with Solid Charges.

The development of the open-hearth process admitted of the stocks of scrap present in the great centres of the iron industry being rapidly depleted, so that there soon began to be a deficiency of the usual good charging materials. In order to be able to carry it on further, one was compelled to